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In Vivo and In Vitro Cardioprotective Effect of Gossypin Against Isoproterenol-Induced Myocardial Infarction Injury

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Abstract

The aim of the study was to examine the protective effects and possible mechanism of gossypin against isoproterenol (ISO)-mediated myocardial damage in vivo and H9c2 cell damage in vitro. H9c2 cells were categorized into five groups. Viability was evaluated with MTT and LDH release in H9c2 cells. Apoptotic parameter analysis was performed with cytochrome c (Cyt-c), caspase-3 (CASP-3), and BCL2/Bax mRNA expression levels. In vivo, gossypin was administered orally to mice at doses of 5, 10, and 20 mg/kg for 7 days. ISO groups were injected with isoproterenol (150 mg/kg) subcutaneously (on 8th and 9th) for 2 days. Afterward, lactate dehydrogenase (LDH), creatine kinase-MB (CK-MB) levels and Troponin-I (Tn-I) amount from their serum, oxidative stress parameters superoxide dismutase (SOD) activity, glutathione (GSH) and malondialdehyde (MDA) levels, and tumor necrosis factor-α (TNF-α), interleukin-6 (IL-6), interleukin-1β (IL-1 β), and NF-kB mRNA expression levels with inflammatory markers from heart tissue were evaluated. In addition, IL-1B, BCL-2, and cas-3 immunohistochemical staining was performed from heart tissue and TNF-a level was measured by ELISA method. Administration of Gossypin protected the cells by dose-dependent, eliminating the reduced cell viability and increased LDH release of ISO in H9c2 cells. In mice serum analyses, increased LDH, CK-MB levels, and Tn-I levels were normalized by gossypin. ISO administration in heart tissue is regulated by gossypin with increased SOD activity, GSH amount, TNF-α, IL-6, IL-1β, and NF-kB mRNA expression levels and decreased MDA amount. Overall, the present results demonstrated that gossypin has a potential cardioprotective treatment for ischemic heart disease on in vivo and in vitro.

Keywords Gossypin · Myocardial infarction · Isoproterenol · Antioxidant · Cardioprotection

Introduction

Ischemic heart diseases resulting from coronary spasm and/or occlusion are among the most common diseases on the World with high risk for morbidity and mortality [1]. As a result of decreased and/or completely blocked coronary blood flow myocardial infarction (MI) occurs. As a result of short- and long-term injuries occurred in the heart ventricles MI occurs. The level of acute damage during MI is related to the level of inflammatory responses such as the release of various inflammatory cytokines, formation of molecular patterns, such as immune cell infiltration, and level of reactive oxygen species [2, 3]. Inflammation and oxidative damage are the main physiopathological changes occurred during MI [4–6].

Isoproterenol(L-b-(3,4-dihydroxyphenyl)-α-isopropyl amino ethanol hydrochloride) is a β-adrenergic receptor agonist drug. In several studies, the state of initiation and/or maintenance of apoptosis between Bcl-2, Bax, Cyt-C, and

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